

# Research helps the fighting of a silo fire again

SP's experience in research into fighting silo fires has again been of benefit, this time in connection with a fire in a wood powder silo at Jönköpings Energi. The following is a brief description of the events and some pictures from the work.

The 15 m high silo, used for the storage of wood powder, has a diameter of 10 m, giving a total volume of about 1000 m<sup>3</sup> and a maximum storage capacity of 200 tonnes of wood powder. At the time of the fire, the silo contained about 130 tonnes.

The fire and rescue service received an alarm for a fire in a fan in an elevator about midnight on Wednesday 7<sup>th</sup> May. It extinguished the fire, but did not note any spread of fire to the silo. Nevertheless, for safety, carbon dioxide was injected into the silo via a fixed carbon dioxide system that had been installed. In the morning, smoke was seen coming from the top of the silo, and the company's own gas detection system indicated that the CO concentration at the top of the silo exceeded 1000 ppm (0.1 %). It was suspected that there was a fire at the top of the silo, and so carbon dioxide continued to be injected at intervals in order to keep the fire under control. However, problems arose in connection with freezing of the gas pipes, and also with the formation of ice in the wood powder around the injection nozzles immediately above ground level. At 11:00 on Thursday, SP Fire Technology was contacted by the Jönköping fire and rescue service, asking for SP's assistance at site with advice



Photo: Henry Persson

*Ice formed around the CO<sub>2</sub> piping system and in the wood powder.*

and recommendations, as well as with instrumentation for monitoring the effect of fire-fighting actions. The Fire and Rescue Service had already ordered a tank of liquid nitrogen, with an evaporator, for continued fire-fighting. Throughout the work, the Fire and Rescue Service had been monitoring the top surface of the wood powder with an IR camera at hourly intervals through one of the covers in the top of the silo.

## SP on site after four hours

During the day, the intensity of the fire was controlled by injection of more carbon dioxide into the top of the silo at regular intervals. The lower injection points had been disconnected because of the freezing at an injection point. SP's personnel arrived at about 15:00 and set up equipment for measuring CO, CO<sub>2</sub> and O<sub>2</sub> concentrations, as well as the tempera-



Photo: Henry Persson

*The carbon dioxide nozzles were removed and replaced by lances for injection of nitrogen into the wood powder.*



Photo: Henry Persson

*The silo in which the fire occurred.*



Photo: Henry Persson

The fire and rescue service checked regularly the surface of the pellets for combustion zones with an IR camera.



The nitrogen tank and evaporator parked by the silo.

Photo: Henry Persson

ture inside the top of the silo. We also assisted in planning continued tackling of the fire. With this information, personnel from Jönköpings Energi quickly manufactured four injection lances and a hose system. The lances were inserted into the silo through the frozen carbon dioxide delivery positions, thus slowly driving nitrogen up through the wood powder. After the gas equipment and nitrogen had arrived, the injection of nitrogen started shortly after 20:00 on Thursday evening. After a few hours' gas injection, it could be seen that the smoke from the top of

the silo was increasing, coupled with a stronger smell, as a result of the nitrogen driving the combustion gases out of the silo. This was followed by steadily falling CO and O<sub>2</sub> concentrations at the top of the silo.

As there was no pressing need at the time to be operating the wood powder boiler, it was decided to continue the establishment of inert conditions in the silo by means of a low flow of nitrogen for the rest of the week and the following week. At the end of this period, the conditions

in the silo were monitored by instrumentation to ensure that the fire had properly been extinguished. At the time of writing work has not started on emptying the silo, but it is expected that it will start at the beginning of June.



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## Fire incidents during tunnel construction: a new project

Together with Lund University and Mälardalen University, SP Fire Technology has been awarded a three-year research project from the Swedish Rescue Services Agency. The consequences of a fire while a tunnel is being built can be very extensive, in the form of personal injuries, damage to property and delays to the work. The objective of the work is to provide rescue services and those responsible for the safety of underground installations with material to assist them in improving the fire safety protection when building tunnels. The project consists of three parts, closely linked to each other:

- 1) Determining heat release rates and the effect of ventilation conditions, based on tests and calculations.
- 2) Investigation of escape conditions for various accident scenarios.
- 3) Calculation and assessment of the rescue services' capacity and ability to act, depending on the fire conditions.

The project will provide information on how risks to personnel can be minimised, by suggesting various tactical and equipment solutions.



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